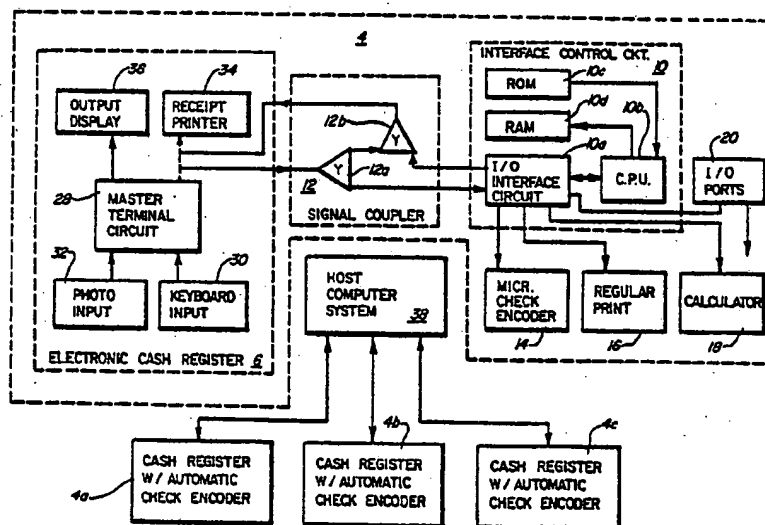




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(54) Title: ELECTRONIC CASH REGISTER TERMINAL WITH AUTOMATIC MICR CHECK AMOUNT ENCODER

**(57) Abstract**

A MICR (14) encoder controlled to automatically print in MICR code the total dollar amount of a purchase as calculated by an electronic cash register (6) or other associated circuitry and indicated by the electrical signals therefrom to eliminate need for further keyboard entry. The electrical signals are obtained via releasable connectors at the juncture of a master terminal circuit (28) with various output devices (34, 36), input devices or a host computer system (38). In addition to MICR encoding, another regular printer (16) is controlled to print the payee's name, the date and the amount on the face of the check and other customer identification, verification or endorsement information on the back of the check. A receipt printer (34) is also controlled to print the total number of encoded checks, the dollar amount of each and the total dollar amount. Input/output ports enable communication with verification systems, other computers or other devices.

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Electronic cash register terminal with automatic MICR check amount encoder.

Background of the Invention

In 1960, after several years of formal study and extensive field testing in cooperation with various office equipment manufacturers, the Federal Reserve Bank formally adopted Magnetic Ink Character Recognition, or MICR, standard encoding format for all automatic check clearing operations. Since that time, ABA bank routing transit codes, individual checking account numbers and dollar amounts have been MICR encoded in a prescribed MICR line field located at the bottom of checks. Within three years, over eighty per cent of all checks processed through the Federal Reserve Bank system conformed to MICR encoding standards. Today virtually all such checks have encoded thereon routing numbers, account numbers and dollar amount.

Reference may be had to the patent art for further information concerning automatic processing and encoding systems for checks such as U.S. patents 4,027,142 of Paup et al., and 4,404,649 of Nunley et al., and other patents referred to herein.

In most cases, MICR encoding of ABA bank routing transit codes, together with individual customer account numbers, have been done by check printers at the time checks are produced. MICR encoding of dollar amounts has been done by banks through manual keyput entry immediately prior to the time checks are placed in the check clearing system. The current average cost of this labor intensive MICR encoding procedure is \$.04 per check.

Retailers, especially supermarkets, process an enormous volume of checks in connection with their sales activities. In 1984, it is estimated that retailers throughout the nation will process approximately ten billion checks. The majority of these

checks will be processed by supermarkets, for only very few of them accept credit cards as a medium of payment.

Currently, retailers are looking forward to the arrival of point of sale (POS) electronic debiting of customers' checking accounts for relief from this check processing burden. This type of on-line transaction not only is very expensive, but it also requires a highly developed, shared network of electronic delivery systems linking retailers with numerous banks. The cost of each POS debit transaction for utilization of the switch alone ranges approximately from \$0.20 to \$0.40 per item. This cost does not even include the cost of purchasing and installing the necessary peripheral devices for the checkout register terminal systems. It is not clear whether banks or their customers would be willing to bear this cost, and POS debiting is not presently installed on any significant commercial scale in this country.

Supermarkets and other retailers recently have begun to lease space to owners of automated teller machines (ATM's) in their stores. Customers use these machines to obtain cash, which may or may not be used for retail purchases. Despite the fact that check volume does not appear to be decreasing at stores where ATM's have been installed, retailers continue to express the hope that ATM networks will prepare the way for POS debit transactions at the checkout lane.

As shown in U.S. patent 4,358,671 of Case, efforts have also been made to enable automatic processing of electronic funds transfer or EFT checks along with regular checks by means of special encoding in addition to the customary MICR encoding.

A different approach is shown in U.S. patent of Benton 4,341,951 in which it is necessary for a user to MICR encode the dollar amount of an EFT voucher through operation of a keyboard.

Many other efforts have been made to automate and speed the processing of checks. As shown in U.S. patent 4,358,671 of Case, efforts have also been made to enable automatic processing of electronic funds transfer or EFT checks together with regular checks by means of special encoding additional to the customary MICR encoding noted above.

Point of sale check verification systems are also known in which an indication of the dollar amount authorized for a check is imprinted on the check. However, this requires the customer or clerk to request authorization for the amount by manipulation of a keyboard. For instance, examples of such check verification systems are shown in U.S. patents 4,109,238 and 4,187,498 of Creekmore. While other printed information may be otherwise placed on the checks, the amounts are not MICR encoded in such verification systems.

In U.S. patent 4,201,978 of Nally, a system is disclosed for automatic MICR encoding of a check without a keyboard. However, this system requires an expensive and sophisticated computer and photosensors for machine reading of handwritten characters at the amount field of a check.

In addition, supermarkets have begun to install keyput entry proof machines in their stores (similar to the ones used at bank processing facilities) to MICR encode dollar amounts on customer checks before sending them to the bank for deposit and subsequent processing through the clearing house system.

While the above systems have done much to facilitate check processing, none of them have directly addressed a simple system for automatic MICR encoding of checks at the cash register point of sale.

Summary of the Invention

It is therefore my principal objective to provide an automatic check encoder for use with an electronic calculating cash register terminal comprising a MICR encoding printer for printing in standard MICR code a dollar amount on the face of a check together with means for controlling the MICR encoding printer with electrical signals generated by an electronic cash register and which relate to calculations performed by the cash register to automatically cause the printer to print a preselected dollar amount calculated by the electronic cash register.

It is also an object to provide a method of automatically

preparing a check for collection at a point of sale having an electronic cash register terminal comprising the steps of inserting the check into printing relationship with a MICR encoder and automatically controlling the MICR encoder to encode a dollar amount of a purchase as entered at the terminal.

Further, it is an object to provide an electronic cash register of the type having a receipt printer, a keyboard and a terminal for storing and performing calculations with respect to data entries made at the keyboard together with means for automatically MICR encoding dollar amounts on checks in accordance with information from the terminal, means for storing said information concerning a plurality of checks and means for controlling the receipt printer to print at least some of the stored information.

Still a further object is to provide a cash register with a check encoder comprising a housing, a regular ink printer within the housing, a MICR encoding printer and means for guiding a check into the housing and into preselected alignment with printing elements of the printer and MICR encoder.

In the preferred embodiment, the automatic check encoder is advantageously designed for retrofitting to existing electronic cash register terminals and advantageously includes means for performing additional operations with respect to the check and the collection process.

Electrical signals from the cash register are obtained at the junctures between the master circuit of the terminal and the receipt printer, or the output display. Alternately, the signals are obtained at the junctures between the terminal master circuit and one or more of the keyboard, photo, weight scale and other inputs.

The signals may also be taken from a communication link between the terminal master circuit and a host computer. In fact, it is also an object to provide a cash register with automatic check encoder system comprising a host computer and a plurality of remote electronic cash registers with check encoders controlled thereby to automatically encode checks concerning all

the checks encoded and to obtain and manipulate information from all the terminals.

Advantageously, the check encoder is designed for retrofitting it with existing cash register terminals and host computers. In one embodiment, releasible hand wire connections are made to retrofit existing cash register terminals with the check encoder at the locations indicated above. In another embodiment, the electrical signals from the cash register terminal are detected by non-invasive means such as an electromagnetic emissions sensor.

In addition to performing the MICR encoding function, the check encoder is also advantageously designed to calculate the total number and dollar amount of a series of checks encoded thereby. In keeping with another objective of the invention, the receipt printer of the cash register terminal is controlled by the check encoder to print the results of such calculations.

Yet a further advantageous feature of the check encoder is the provision of a regular printer and means to control it to print other information on the check such as the payee, the date, time of day, account number, etc.

Achievement of these objectives advantageously results in a significant reduction in the cost of MICR encoding checks, a reduction in menial repetitive labor, elimination of human error in the encoding process and therefore reduction in error correction labor.

Brief Description of the Drawings

The foregoing objects, features and advantages will be described in greater detail and further advantageous features will be made apparent from the detailed description of the preferred embodiment which is given with reference to the figures of the drawing, in which:

Fig. 1 is a functional block diagram of the preferred embodiment of the electronic cash register with automatic check encoder of the present invention; and

Fig. 2 is a more detailed functional block diagram of the

terminal master circuit, the signal coupler and the interface control circuit of Fig. 1;

Figs. 3A and 3B are plan and side sectional views of a check encoder of the present invention illustrating the combination of a MICR and regular printer within one housing.

Detailed Description

Referring now to the drawing, particularly Fig. 1, a preferred embodiment of the electronic cash register terminal with automatic check encoder 4 is seen to include an electronic cash register terminal, or cash register, 6 and an automatic check encoder 8.

The check encoder 8 is seen to comprise an interface control circuit 10 interconnected with the electronic cash register 6 through means of a signal coupler 12. Both the electronic cash register 6 and the signal coupler 12 are shown in greater detail in and will be described in reference to Fig. 2. However, briefly, the interface control circuit 10 contains electronic dynamic and static memory, a central processing unit and interface circuitry for two way communication with the remaining portion of the automatic check encoder 8 and the cash register 6.

The remaining portion of the automatic check encoder comprises a MICR check printer, or encoder, 14, a regular printer 16, a calculator 18 and input/output, or I/O, ports 20.

The MICR check encoder 14 comprises a special printer which prints with magnetic ink in standard Magnetic Ink Character Recognition (MICR) characters as adopted by the American Bankers Association as described above or any other standard machine readable code which may be adopted as a standard for automatic check processing. Examples of what such MICR encoding looks like can be found at the bottom of virtually any check drawn on a United States bank or by reference to various patents such as U.S. patents 4,201,978 of Nally or 4,358,671 of Case, discussed above. Apparatus which print MICR characters from keyboard entries are well known, and one which is controlled automatically from a character recognition computer is shown in Nally

4,201,978. Accordingly, the electronic details of such a MICR encoder form no part of this present invention, and reference should be made to these other references if further detail is desired.

The regular printer 16, as its name implies, is other than a special MICR encoding printer and simply prints in customary alphanumeric characters such as used with cash registers, check verification machines and other business machines.

However, unlike known MICR encoders and regular printers, the MICR check encoder 14 and regular printer 16 of the present invention advantageously share a common check holder 22 and a common housing 24 which preferably also houses one or more of the other elements of automatic encoder 8.

As seen in Fig. 3A and 3B, the MICR check encoder 14 is contained within a sub-assembly housing 22 of a housing 24 which contains all of the elements of automatic check encoder 8. Also contained within sub-assembly housing 22 is a regular printer 16 together with input printing elements 16a, 16b, 16c and 16d for respectively printing the date, the amount and the payee on the face side 26f of a check 26 and endorsement, verification, customer identifying or other information on a back side 26b of the check 26. Such customer identifying verification and other information includes one or more of the date, time, dollar amount, account number and a form with blanks for indicating the drawer's identifying information, such as credit card, telephone and drivers license numbers, and endorsement information.

In an alternative embodiment of the present invention, the interface control circuit 10 interfaces through its I/O ports 20 with a check verification computer. In such case, printer elements 16d of the regular printer 16 are also controlled to print verification information.

Returning again to Fig. 1, the calculator 18 includes means for storing information concerning the MICR encoded checks and means for manipulating this information. Preferably, it stores the number of checks successively encoded by MICR check encoder 14, the dollar amount of each such check and a running total of

the dollar amount of the stored number of checks.

Additionally, the calculator 18 performs other functions such as calculating and storing the average dollar amount and storing the totals from previous check series or shifts.

The input/output, or I/O ports, 20 are advantageously provided for connection with other apparatus, such as a check verification system or master computer for controlling or accumulating encoded check information from a plurality of electronic cash registers with automatic check encoders 4a, 4b and 4n, Fig. 2.

Referring further to Fig. 2, the electronic cash register terminal 6 is seen to include a master terminal circuit 28 interconnected with a keyboard input device 30 and a bar code reader or other photo input device 32 provided for receiving item price information and providing it to the master terminal circuit 28. A weight scale input device (not shown) is optionally provided. The master terminal circuit 28 includes input/output interface circuitry, memory devices and a CPU (not shown) for performing calculations and storing information concerning the input entries.

The circuitry of master terminal circuit 28 also comprises means for controlling various read out devices such as a receipt printer 34. The receipt printer is a regular ink printer for providing the price of each item and an item code, sub-totals, grand total, sales tax and other information, such as date, cashier's identification or shift code, etc. An output display 36 is also provided to give a clear visual indication of all the inputs and outputs of the master terminal circuit as they are each entered.

The electronic cash register with automatic check encoder 4 may be operated as a self contained unit. However, in many applications, it will comprise only one of several terminals, such as an electronic cash register with automatic check encoder terminals 4a, 4b and 4n connected with a common host computer system 38. These cash registers 4a, 4b and 4n are substantially identical to register 4 and operate in the same fashion. In such

event, some of the central processing and storage functions of the master terminal circuit 28 and even the interface control circuit 10 can be performed by the host computer system with the master terminal circuit performing primarily control and interface functions only.

The interface control circuit 10 includes an I/O interface circuit 10a which interfaces a central processing unit, or CPU, 10b through a signal coupler 12 with the electronic cash register 6. The CPU 10b is, of course, also connected with a read only memory, or ROM, 10c and a random access memory, or RAM, 10d. In a cash register with automatic check encoder 4 built new as a unit, the encoder 8 may be hand wired to the cash register 6. In retrofit applications, however, the signal coupler 12 is preferably provided with means for releasably coupling the encoder 8 to register 6.

In one embodiment, as shown in Fig. 2, the signal coupler 12 comprises a pair of Y-connectors 12a and 12b. The individual terminals of Y-connectors 12a and 12b are interconnected between the master terminal circuit 28 and one of the input or output devices 30, 32, 34 or 36, or the host computer systems 38 in substitution of the normal interconnection therebetween. Alternately, an electromagnetic emission sensor is simply clamped to one of the interconnections to non-invasively pick-up the desired electrical signals from or to the master terminal circuit.

Preferably, the electrical signals are picked up from one of the outputs of master terminal circuit, such as the output to the receipt printer 34, as shown, for then the calculations sub-totals and totals performed by the master terminal circuit or by the host computer system are available to the automatic check encoder. Other connections to obtain output signals are taken from the outputs to either display 36 or to host computer system 38. Alternately, the electrical signals are taken from one or more of the input devices such as the keyboard input 30 and photo input 32. In such event, the desired calculations are all performed by the calculator 18.

The electronic cash register terminal with automatic check encoder 4 is used in the following manner. First, the items being purchased are entered into the register via the keyboard input 30, the photo input 32 and any auxiliary inputs such as a weight scale input. The customer then delivers a blank check 26 to the cashier. If the check has not already been verified, verification may be achieved automatically by then using a verification card with a coded magnetic strip to identify the customer to a verification system coupled through the I/O ports 20, for instance. The blank check 26 is then placed into the check holder 22 and aligned thereby into position for receiving printing from both the regular printer 16 and the MICR check encoder 14. If the output signals from the cash register 6 are employed by the encoder 8, then when a total amount due is calculated by the register 6, the MICR check encoder 14 and printer 16 are controlled to automatically print in the proper location on the face of the check the date, the payee, the amount in regular print and the amount in MICR encoded print. Also, on the back of the check is printed, if desired, verification information such as the date and time of verification, the store code, and verification number or other indication of approval, forms with blanks for automatic identification such as credit card, driver's license and telephone numbers and endorsement information such as account number, store name and restrictive endorsement legends. If the check 26 has already been signed, then it may automatically be moved by the check holder 22 to a secure location in connection with the check holder 22. If not, it is removed from the holder 22, signed and returned to the cashier.

Preferably, at the end of a shift or otherwise when desired, the interface control circuit 10 is caused to control the receipt printer 34 to print the total number of checks which have been encoded, the dollar amount encoded on each of the checks and the total dollar amount of all the number of checks. These calculations are cleared from memory for the next shift or are stored in a separate sub-total memory for further reference and

possibly display or printing upon completion of the final shift at the end of the work day.

If a host computer system is present, then this cumulative information is also transmitted to the host computer system 38 via the I/O ports 20 or through a connection with the master terminal circuit 28. This information may also transmit information via the I/O ports 20 to other devices.

While a particular embodiment has been disclosed, it should be appreciated that variations may be made with respect thereto without departing from the scope of my invention as defined in the appended claims.

CLAIMS

1. An automatic check encoder for use with an electronic calculating cash register terminal, comprising:

a MICR encoding printer for printing in standard MICR code a dollar amount on the face of a check;

means for controlling the MICR printer in accordance with electrical signals generated by an electronic cash register which relate to calculations performed by the cash register to automatically cause the printer to encode a preselected dollar amount calculated by the electronic cash register.

2. The automatic check encoder of claim 1 in which said controlling means includes an interface circuit responsive to said cash register electrical signals to provide corresponding control signals to said MICR encoding printer.

3. The automatic check encoder of claims 1 or 2 in which said controlling means includes a Y-adapter for coupling output electrical signals from the electronic cash register to both the interface circuit and another device used in conjunction with the cash register.

4. The automatic check encoder of claim 2 in combination with

a regular ink printer for automatically imprinting selected information on a check in preselected locations thereon, and in which

said interface circuit includes means for providing control signals to said regular ink printer in addition to providing control signals to said MICR encoding printer.

5. The automatic check encoder of claims 2 or 4 in combination with

a calculator for performing calculations with respect to information from the electronic cash register, and in which said interface circuit includes means for providing control and information signals to said calculator in response to signals from said cash register in addition to providing control signals to said MICR encoding printer.

6. The automatic check encoder of claim 5 in which said interface circuit includes an input/output port for releasable coupling of the interface signals with other devices.

7. The automatic check encoder of claims 2 or 4 in which said interface circuit includes an input/output port for releasable coupling of interface signals with devices other than the MICR encoding printer.

8. The automatic check encoder of claims 1, 2 or 4 including

a regular printer, and

means for controlling the regular printer to print on a check information selected from at least one of the following types of information: date, time, payee's name, dollar amount, account number, form with blanks for drawer's identifying information, verification information and endorsement information.

9. The automatic check encoder of claim 1 including means for storing information concerning the checks MICR encoded by said printer.

10. The automatic check encoder of claim 9 including

means for calculating the total number of checks which has been MICR encoded, and

means for providing said total number to said storing means for storage of said number.

11. The automatic check encoder of claims 1, 9 or 10 including

means for calculating the aggregate total dollar amount of a plurality of checks successively MICR encoded by said

printer, and

means for providing this aggregate total dollar amount to said storing means for storage.

12. The automatic check encoder of claims 9 or 10 in which said information stored by said storing means includes at least one of the following types of information: (a) the number of checks encoded, (b) the dollar amounts of each of the encoded checks, and (c) the total dollar amount of all checks encoded.

13. The automatic check encoder of claim 12 including means for sharing use of a printer employed by the cash register to print receipts to also print at least some of the information stored in said storing means.

14. The automatic check encoder of claim 1 including
a regular printer, a calculator, an interface circuit and means for housing the regular printer, the calculator and the interface circuit together with the MICR encoding printer.

15. The automatic check encoder of claim 1 in which said controlling means includes an interface circuit including an electromagnetic emissions sensor for detecting the signals generated by the electronic cash register.

16. The automatic check encoder of claim 1 in which said controlling means includes
a control circuit, and
means for interfacing the cash register with the control circuit.

17. The automatic check encoder of claim 16 in which said interface is coupled to the cash register at a coupling junction between a cash register terminal and one or more of a cash register, receipt printer, a cash register display terminal, a cash register keyboard, and a photo input device with a cash register terminal.

18. The automatic check encoder of claims 16 or 17 in which the interface is coupled to the cash register at a communications link between the cash register terminal and a host computer system.

19. In an electronic cash register having a receipt printer,

a keyboard and a terminal for storing and performing calculations with respect to data entries made at the keyboard, the improvement comprising:

means for automatically MICR encoding dollar amounts on checks in accordance with information from the terminal;

means for storing said information from the terminal concerning a plurality of checks successively encoded by said MICR encoding means; and

means for controlling the receipt printer to print at least some of the stored information.

20. The electronic cash register of claim 19 in which said stored information includes at least one of the number of successively encoded checks, the dollar amount of each of the checks and the total dollar amount of said number of checks.

21. The electronic cash register of claim 19 in which said MICR encoding means includes

a MICR encoding printer, and

means for controlling the printer in accordance with said terminal information.

22. The electronic cash register of claims 1 or 21 in which said information from the terminal includes the total dollar amount of a purchase as calculated by the terminal, and said total dollar amount is encoded on a check presented for payment.

23. A method of automatically preparing a check for collection at a point of sale having an electronic cash register terminal, comprising the steps of:

inserting the check into printing relationship with a MICR encoder; and

automatically controlling the MICR encoder to encode the check with the total dollar amount of a purchase as entered at the terminal.

24. The method of claim 23 including the step of controlling a receipt printer of the cash register terminal to alternately print receipt information and information concerning the encoded checks.

25. The method of claims 23 or 24 including the step of automatically controlling the step of deriving total dollar amount information from electronic signals produced by the terminal.

26. The method of claim 24 in which said step of deriving total dollar amount information includes the step of sensing electromagnetic emissions from corresponding electrical signals of the cash register terminal..

27. The method of claims 23 or 24 including the step of printing on the check information of at least one of the following types of information: payee's name, date, time of day, dollar amount, form with blanks for driver's identifying information and endorsement information.

28. A cash register with a check imprinter, comprising:
a housing;
a regular ink printer within the housing;
a MICR encoding printer; and
means for guiding a check into the housing and into preselected alignment with printing elements of said printer and MICR encoder.

29. The cash register of claim 28 in which said cash register includes
means for controlling an MICR encoder in accordance with said calculation to imprint an MICR code on a check the amount calculated.

30. The cash register of claim 1 in which said register printer has spaced apart printing elements for printing at least one of a payee's name, the date and the dollar amount at preselected locations on a check.

31. A cash register with automatic check encoder system, comprising:
a host computer; and
a plurality of remote electronic cash register terminals with

special encoders for printing dollar amounts on checks in special machine readable code employed by banks in

check collection processing,

means for coupling signals between the host computer system and the terminal, and -

means responsive to receipt of signals from the host computer system to control the special encoder.

32. The cash register with automatic check encoder system of claim 31 in which each of said terminals includes means for printing other information on a check in regular characters different from the special machine readable code.

33. The cash register with automatic check encoder system of claims 31 or 32 in which each of said terminals includes a housing for said special printing and regular printing means and means for receipt of a check within the housing in a preselected alignment with the special printing and regular printing means.

34. The cash register with automatic check encoder system of claim 33 in which said coupling means includes an interface circuit at each of said terminals for coupling informational signals between the host computer and the terminal.

35. The cash register with automatic check encoder system of claim 31 in which said host computer includes means for obtaining and calculating information from all the registers concerning all the checks encoded thereby.

AMENDED CLAIMS

[received by the International Bureau on 28 October 1985 (28.10.85);
original claim 23 amended; remaining claims unchanged (1 page)]

a keyboard and a terminal for storing and performing calculations with respect to data entries made at the keyboard, the improvement comprising:

means for automatically MICR encoding dollar amounts on checks in accordance with information from the terminal;

means for storing said information from the terminal concerning a plurality of checks successively encoded by said MICR encoding means; and

means for controlling the receipt printer to print at least some of the stored information.

20. The electronic cash register of claim 19 in which said stored information includes at least one of the number of successively encoded checks, the dollar amount of each of the checks and the total dollar amount of said number of checks.

21. The electronic cash register of claim 19 in which said MICR encoding means includes

a MICR encoding printer, and

means for controlling the printer in accordance with said terminal information.

22. The electronic cash register of claims 1 or 21 in which said information from the terminal includes the total dollar amount of a purchase as calculated by the terminal, and said total dollar amount is encoded on a check presented for payment.

23. A method of automatically preparing a check for collection at a point of sale having an electronic cash register terminal, comprising the steps of:

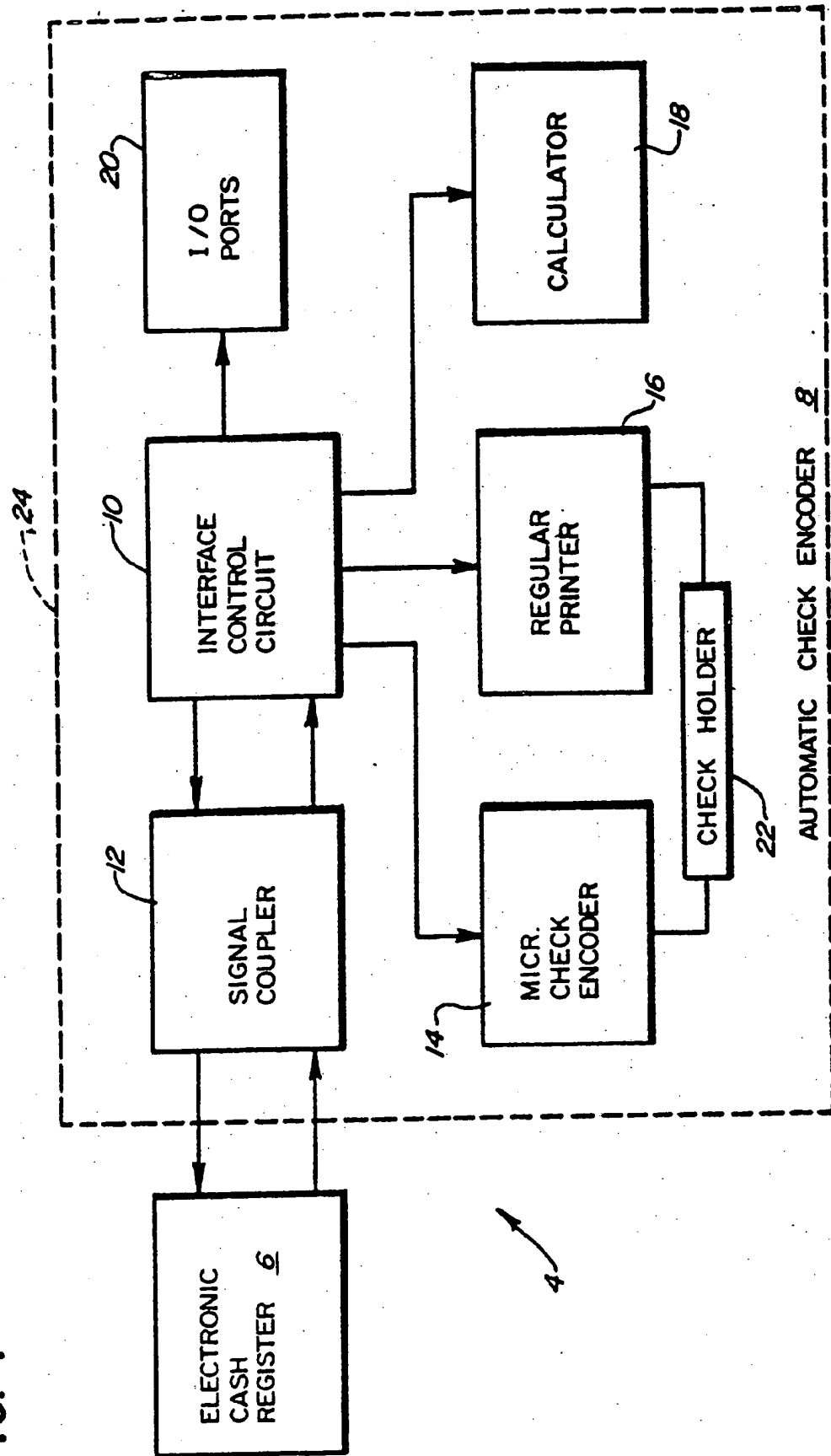
inserting the check into printing relationship with a MICR encoder; and

automatically controlling the MICR encoder to encode the check with the total dollar amount of a purchase as calculated at the terminal.

24. The method of claim 23 including the step of controlling a receipt printer of the cash register terminal to alternately print receipt information and information concerning the encoded checks.

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FIG. 1



2/3

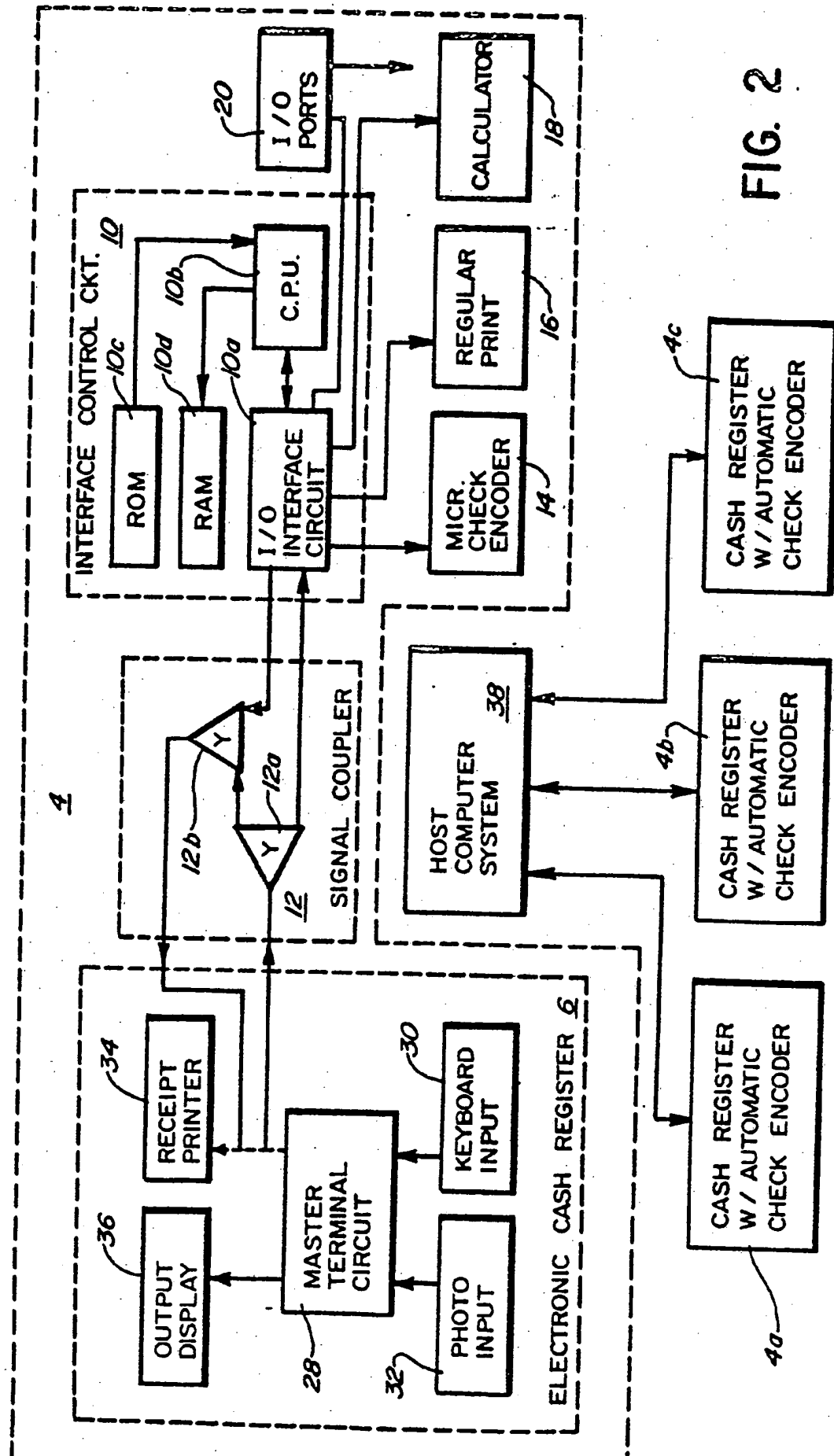


FIG. 2

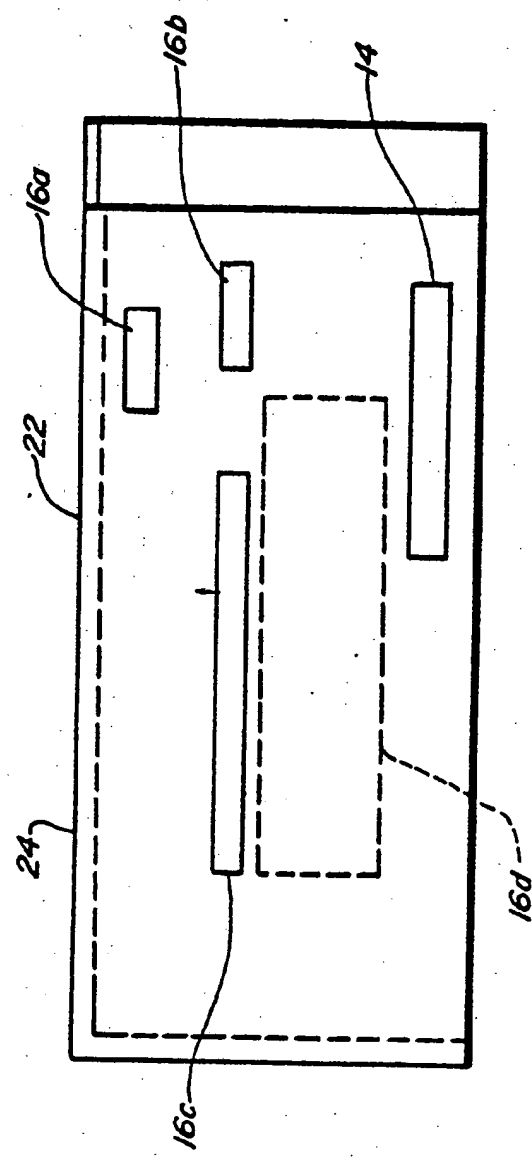


FIG. 3A

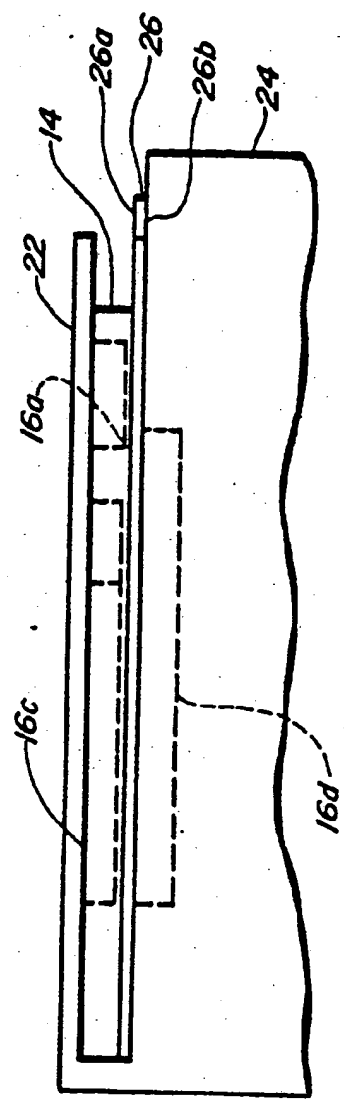


FIG. 3B

INTERNATIONAL SEARCH REPORT

International Application No PCT/US85/01196

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC INT. CL. G06F 15/21 ; G06F 15/30 ; G06K 15/02 ; G06K 1/18 U.S. CL. 364/405 ; 235/379, 432, 493		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S.	235/379, 432, 493 364/405	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category ⁶	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
A	US, A, 4,172,552 (CASE ET AL) 30 October 1979 (30.10.79), see column 1, line 49 through column 2, line 3 and column 4, lines 5-11.	
A	US, A, 4,187,498 (CREEKMORE) 05 February 1980 (05.02.80), see figure 4 and column 10, lines 31-39.	
A	US, A, 4,201,978 (NALLY) 06 May 1980 (06.05.80), see column 2, lines 55-68 and column 8, lines 8-13	
Y	US, A, 4,213,179 (HAMANO ET AL) 15 July 1980 (15.07.80), see figures 21, 22 and 24.	1-35
A	US, A, 4,262,589 (GEBHARDT) 21 April 1981 (21.04.81), see column 3, lines 40-58.	
Y	US, A, 4,310,885 (AZCUA ET AL) 12 January 1982 (12.01.82), see figure 2 (key 94), column 2, lines 30-34, column 7, lines 44-50 and column 8, lines 33-41.	1-35
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁹ Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"G" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ¹		Date of Mailing of this International Search Report ²
26 July 1985		06 AUG 1985
International Searching Authority ¹		Signature of Authorized Officer ²⁰
ISA/US		Clark Jablon

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No ¹⁸
A	US, A, 4,358,671 (CASE) 09 November 1982 - (09.11.82).	
Y	US, A, 4,385,285 (HORST ET AL) 24 May 1983 (24.05.83), see figure 3, column 4, lines 48-49 and column 5, lines 1-3.	1-35
A	US, A, 4,417,136 (RUSHBY ET AL) 22 November 1983 (22.11.83), see column 4, line 59 through column 5, line 6.	
A,P	US, A, 4,523,330 (CAIN) 11 June 1985 (11.06.85), see column 1, lines 24-29 and column 9, lines 61-65.	
A	US, A, 4,404,649 (NUNLEY ET AL) 13 September 1983 (13.09.83).	
A	US, A, 4,321,672 (BRAUN ET AL) 23 March 1982 (23.03.82).	